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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/753,662	01/04/2001	Shigeto Fujimura	1592-0131P	1881

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EXAMINER
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ANDERSON, MATTHEW A

ART UNIT	PAPER NUMBER
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1722

DATE MAILED: 06/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/753,662

Applicant(s)

FUJIMURA ET AL.

Examiner

Matthew A. Anderson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 29 April 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) 5-10 and 12 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4, 11 and 13 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 January 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114 was filed in this application after appeal to the Board of Patent Appeals and Interferences, but prior to a decision on the appeal. Since this application is eligible for continued examination under 37 CFR 1.114 and the fee set forth in 37 CFR 1.17(e) has been timely paid, the appeal has been withdrawn pursuant to 37 CFR 1.114 and prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on 4/29/2005 has been entered.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a

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later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claim 1-3, 11, 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuda et al. (US 5,554,219) in view of Dutta et al. (US 6,273,969 B1) and Kingery et al. (Introduction to Ceramics, Second Ed., John Wiley & Sons, New York, USA, pp. 328-346, 1976.)

Fukuda et al. discloses a process for the production of bulk single crystal ZnSe (zinc selenide). Zn Se is disclosed in the first sentence of col. 1 as a known semiconductor used in, for example, lasers. The background in the same column stresses the need to avoid twinned (i.e. poly-crystal) growth during the production of bulk monocrystals of ZnSe. In lines 18-29 and 44-57 is delineated the process. A VF (vertical Bridgeman as in the claims) or a VGF (vertical gradient freezing) furnace was used. Those of ordinary skill in the art recognize that the gradient in question is a temperature gradient. A crucible was used to contain the melt within the vertical furnace. The raw material was melted and then a portion at the lower tip of the crucible was solidified by cooling. The crystal growth was then stopped. Then part of the resultant poly-crystalline ZnSe in the crucible tip was remelted. Then, from the lower surface of the melt in contact with the remaining solid raw material, crystallization was resumed by cooling the melt by moving the crucible down at a certain rate. The result was

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twin-free bulk ZnSe. The examiner notes that nuclei are the art accepted points at which crystal growth is initiated.

Fukuda et al. does not explicitly disclose the nucleation as promoted by the solid raw material or the use of an encapsulant.

Dutta et al. discloses the method for making alloys of semiconductors including ZnTe, ZnSe, CdTe, CdSe (col. 4 lines 49-56) by VF methods including the use of an encapsulant including boric oxide ( $B_2O_3$ ). The encapsulant prevents the vaporization of a volatile component of the melt.

Kingery et al. discloses the basic and expected nature of the stages of crystal growth including nucleation and growth (see page 328 and 336).

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine the above references because thereby the growth using a VF method would produce an semiconductor alloy of constant stoichiometry due to the prevention of vaporization. In addition, one of ordinary skill would have used the universally accepted nucleation/growth of Kingery et al. in order to understand the crystal formation that would have been expected to be achieved with the Fukada et al. and Dutta et al. combined process because both have crystal growth. Without nucleation one of ordinary skill in the art would not have expected crystal growth.

It would have been obvious to one of ordinary skill in the art at the time of the present invention that, in a crucible existing in a vertical furnace in which a raw material had been melted and in which existed a solid portion of raw material which was yet not a seed crystal as per claim 1, crystal growth of a compound

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semiconductor single crystal would have occurred because such is described by Fukuda et al in embodiment 5.

It would have been further obvious to one of ordinary skill in the art at the time of the present invention that the crystal growth occurred from nuclei existing at the surface of the solid raw material adjacent to the raw material melt because such growth occurred in Fukuda et al. and would have been consistent with the art accepted 'nucleation/growth' hypothesis of crystal growth presented by Kingery et al..

It would have been further obvious to one of ordinary skill in the art at the time of the present invention to use  $B_2O_3$  as the encapsulant for a ZnTe or CdTe VF crystal growth method because such is suggested by Dutta et al. Dutta et al. discloses that VF methods are interchangeable for growing ZnSe, ZnTe, and CdTe.

And, In respect to claim 13, it would have been obvious to one of ordinary skill in the art at the time of the present invention to optimize the temperature in Fukuda's VGF process since temperature was a known result effective variable in the process.

5. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuda et al. and Dutta et al. as applied to claims 1-3, 11, 13 above, and further in view of Taniguchi et al. (US 5,603,763).

The combination is described above.

The combination does not disclose nucleation on the top surface of the melt.

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Taniguchi et al. discloses the formation of CdTe by a VF method of crystal growth. In col. 12 15-30, it is disclosed that the nuclei are formed only on top of the melt away from the crucible wall and thus single crystals are easily obtained. Taniguchi et al. uses a controlled atmosphere (Cd vapor) to control surface volatilization of Cd.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine the methods above because the atmosphere controlled method represented by Fukuda et al. and Dutta et al. is then protected from polycrystal (i.e. twin) formations. The substitution of one way of atmosphere control for another would have been obvious to one of ordinary skill.

### ***Response to Arguments***

6. The applicant's arguments of 4/29/2005 have been considered but are not convincing.

7. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the disclosure that the solidified material is used for preventing the raw material melt from being super-cooled) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

8. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant

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relies (i.e. the meaning of the word "surface") is not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

The argument about how to interpret the term "surface" is not convincing. Those of ordinary skill in the material science art recognize a surface to be the boundary between phases of matter. The exterior boundary of the liquid raw material melt in the container with the solid at the bottom of the melt is thus a surface.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew A. Anderson whose telephone number is (571) 272-1459. The examiner can normally be reached on M-F, 8:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (571) 272-1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MAA  
June 8, 2005

  
**GREGORY MILLS**  
**SUPERVISORY PATENT EXAMINER**  
**TECHNOLOGY CENTER 1700**